

REMARKS

By way of the present response, new claims 61-69 are added to claim subject matter entitled to Applicant. Applicant submits that new claims 61-69 are readable on the provisionally elected species. Claims 1-69 currently are pending, with claims 10-36 withdrawn from consideration by the Examiner.

The Examiner is again requested to acknowledge and answer Applicant's traversal of the restriction, as set forth in the response dated April 6, 2006. More specifically, Applicant argued claim 1 is generic because it includes fewer steps and does not include prior formation of an amorphous layer prior to crystallization in claims 10-36, and that as a result, claims 10-36 may be subject to rejoinder if claim 1 is considered allowable.

Starting with section 2 on page 2 of the Office Action, the Examiner rejects claims 1-5, 7, 8, 37-41, 43, 44, 46-50, 52 and 53 under 35 U.S.C. 103 as allegedly being obvious over Grigoropoulos et al. (US Patent Application Publication No. 2003/0003636) in view of Wakita (U.S. Patent No. 6,072,194). This rejection is respectfully traversed.

In the most recent Action, the Examiner asserts that Figure 1 and paragraph 0029 of the Grigoropoulos et al. publication teach a method of making a semiconductor device in which a semiconductor film (104) is subjected to irradiation by a second laser beam (108) in a direction from the semiconductor layer (104) to the substrate (102), and irradiated with a first laser beam (106) coming from the side of the transparent substrate (102) to the semiconductor layer (104). Next, the Examiner acknowledges, "[Grigoropoulos] does not teach repeated radiation of the semiconductor layer" (see, sections 4, 12 and 18). To the extent the Examiner is referring here to the actual claim language, "irradiating a second laser beam to the crystalline semiconductor film through the substrate in a direction from the substrate to the crystalline semiconductor film after irradiating the first laser beam," as recited in independent claims 1, 37 and 46, Applicant agrees with this statement.

In addressing this acknowledged deficiency, the Examiner relies on the Wakita et al. patent for its teaching of laser annealing in three or more steps. The Examiner concludes that

it would have been obvious to one of ordinary skill in the art to repeat the annealing process taught by Grigoropoulos et al. three or more times to reduce the number of defects and to flatten the surface of the layer. It is respectfully submitted, however, that the Section 103 rejection cannot stand, as there is simply no motivation, teaching or incentive, as well as reasonable expectation of success within the purview of Section 103 that would have led a person of ordinary skill in the art to combine the various features of these references to arrive at the invention recited in claims 1, 37 and 46.

The Grigoropoulos et al. patent teaches, "After an initial delay, a second laser beam with shorter pulse duration is superpositioned with the first laser beam" (see, lines 10-12 of the abstract). Grigoropoulos further teaches, "The first laser beam prolongs the molten Si phase and induces grain growth in a certain direction. The second laser beam triggers nucleation and controls grain location leading to subsequent lateral grain growth" (see, the last four lines of the abstract). As the Examiner can appreciate from the above description, and also in view of at least paragraphs 0006, 0029 and 0075, and Figure 2, Grigoropoulos et al. explicitly teaches to superposition the application of laser beams. Grigoropoulos et al. does not otherwise hint at irradiating laser beams separately in timing. Thus, to carry out annealing according to Grigoropoulos et al., the first laser beam and the second laser beam must be superpositioned. In other words, it would appear having the first and the second laser beams superpositioned (i.e., not separate in timing) is a principle of operation of the Grigoropoulos reference. Hence, as correctly acknowledged by the Examiner, the Grigoropoulos et al. patent fails to teach "irradiating a second laser beam to the crystalline semiconductor film through the substrate in a direction from the substrate to the crystalline semiconductor film after irradiating the first laser beam," as claimed.

With respect to Wakita et al., this patent does not merely teach "repeated irradiation," as the Examiner appears to suggest. Rather, Wakita et al. teaches, "Laser anneal processing of a semiconductor layer is repeated in a number of steps ... As a defective crystallization region occurs in an excessive energy region during the ELA for the first step, in the ELA for the second time, excessive energy is removed and the defective crystallization region is eliminated by reducing the energy to an optimal value, thereby improving the crystallinity of

a p-Si layer” (see, the abstract). Therefore, when the second step of laser anneal processing is performed, the defective crystallization region would have to be formed by the first step. In other words, Wakita et al. requires that the first and the second laser beams must be separate in timing. In addition, Wakita et al. discloses irradiation only from one side of the substrate (see, Figure 7 and column 7, lines 25-58). Further, Wakita et al. teaches that laser energy is reduced the second time ELA is applied to prevent higher quality crystals produced in the first ELA operation from being degraded (see, column 3, lines 45-50).

In view of the above, it is respectfully submitted that the Grigoropoulos et al. and Wakita et al. documents are not properly combinable into the invention defined in independent claims 1, 37 and 46. As pointed out above, Grigoropoulos et al. and Wakita et al. involve fundamentally different methods with respect to the timings of a first and a second laser beam, and thus actually *teach away* from each other. Moreover, Wakita et al. does not otherwise mention or suggest irradiation by a second laser to the crystalline semiconductor film through the substrate in a direction from the substrate to the crystalline semiconductor film after irradiating the first laser beam, as claimed. Consequently, even if one were to consider *arguendo* modifying Grigoropoulos et al. based on the Wakita et al. disclosure, any such modification would appear to alter the principal operation of the Grigoropoulos et al. reference, which renders the suggested combination insufficient for establishing a *prima facie* case of obviousness. See, MPEP § 2403.01.

Hence, while Grigoropoulos et al. and Wakita et al. might be considered similar in that each teaches a way to crystallize a film using laser irradiation, the facts clearly show that these documents teach fundamentally different ways to crystallize a film. As such, there would have been no suggestion in either Grigoropoulos et al. or Wakita et al. to “repeat” the Grigoropoulos et al. method involving superpositioned lasers “three or more times,” as suggested by the Examiner.

Nor do these references contain any teaching or suggestion that would that there have suggested a reasonable expectation of success in connection with reducing defects if the Grigoropoulos et al. method were to be simply repeated, as proposed by the Examiner,

especially in view of the requirement in Wakita et al. of decreasing the energy of each subsequent irradiation by the lasers and other differences pointed out above. Absent such a showing pointing out why there would have been a reasonable expectation of success with respect to the specific teachings in Grigoropoulos et al. and Wakita et al., no *prima facie* case of obviousness has been established.

In short, there is simply no teaching, suggestion or motivation within the references themselves to combine the various features disclosed therein in the manner recited in independent claims 1, 37 and 46. To the contrary, the teachings of Wakita et al. and Grigoropoulos et al. are fundamentally different from one another. Nor has the Examiner shown any reasonable expectation of success for his proposed combination. While the Examiner recognizes the necessity of finding motivation, on page 5 of the Office Action, he fails to find it in the references themselves. Instead, the Examiner impermissibly relies upon the teachings in Applicant's own specification for the requisite teachings, suggestions and motivations to combine these references.

For all the above reasons, it is respectfully submitted that one of ordinary skill in the art would not have been motivated to combine the Grigoropoulos et al. and Wakita et al. documents, as suggested by the Examiner, and that Grigoropoulos et al. and Wakita et al. would have actually *taught away* from any modification of Grigoropoulos et al. that would have been required to arrive at Applicant's claims.

The Action also includes a rejection of claims 55 to 60 under 35 U.S.C. 103(a) as allegedly being unpatentable over Grigoropoulos et al. in view of Wakita et al. and further in view of Chang (US Patent No. 6,399,959); and a rejection of claims 6, 9, 42, 45, 51 and 54 under 35 U.S.C. 103(a) as allegedly being unpatentable over Grigoropoulos et al. in view of Wakita et al. and further in view of Ogawa et al. (US Patent No. 6,884,699). However, it is respectfully submitted that neither the disclosure relied upon in Ogawa et al. of using a second harmonic of a YAG laser nor the description of metal induced crystallization in the Chang patent remedies the shortcomings pointed out above with respect to independent claims 1, 37 and 46. Hence, no combination of the Grigoropoulos et al., Wakita et al., Ogawa

et al. and Chang documents would have taught or suggested the claimed subject matter.

The remaining rejected claims depend from one of allowable claims 1, 37 and 46, and are therefore allowable at least for the above reasons, and further for the additional features recited.

For analogous reasons, the subject matter recited in new claims 61 to 69 are not taught or suggested by the applied references. For instance claim 61 recites, among other things, “irradiating a second laser beam to the crystalline semiconductor film through the substrate in a direction from the substrate to the crystalline semiconductor film after irradiating the first laser beam.” Additionally, claim 61 recites the feature of “to segregate the metal element to defects in the crystalline semiconductor film,” which is supported, for example, at least on page 4, lines 1-16 of the specification. Accordingly, claims 61-69 are allowable.

Based on the forgoing, it is respectfully submitted that the pending rejections of claims 1-9 and 37-69 are improper and should be withdrawn. Prompt notification of the same is earnestly sought.

Respectfully submitted,

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